

Submandibular gland involvement in squamous cell carcinoma of the oral cavity

Original Article

Authors

- Rita Peça**
Unidade Local de Saúde Santa Maria, Lisboa
- Mariana Correia**
Unidade Local de Saúde Santa Maria, Lisboa
- Cláudia Rosa**
Unidade Local de Saúde Santa Maria, Lisboa
- Carolina Arede**
Unidade Local de Saúde Santa Maria, Lisboa
- Maria José Santos**
Unidade Local de Saúde Santa Maria, Lisboa
- Mafalda Correia de Oliveira**
Unidade Local de Saúde Santa Maria, Lisboa
- Paulo Pereira**
Unidade Local de Saúde Santa Maria, Lisboa
- Ana Rita Santos**
Unidade Local de Saúde Santa Maria, Lisboa
- Mariana Calha**
Unidade Local de Saúde Santa Maria, Lisboa
- Leonel Luís**
Unidade Local de Saúde Santa Maria, Lisboa

Correspondence:
Rita Peça
ritacostapec@icloud.com

Article received on May 6, 2025.
Accepted for publication on August 10, 2025.

Abstract

According to the classification by the American Academy of Otolaryngology, excision of the submandibular gland is included in level IB neck dissection (ND). However, the routine removal of this gland in patients with oral cavity squamous cell carcinoma (OCSCC) remains a subject of debate. This study aims to characterize the OCSCC patient population and assess the incidence of submandibular gland involvement in this context. We conducted a retrospective study of patients with OCSCC who underwent ND between 2019 and 2024. A total of 104 patients were included, all of whom underwent ND involving levels I–III or I–IV. Positive lymph nodes were identified in 51.9% of cases. Submandibular gland invasion was observed in only one patient (1.0%), representing a case of direct extension. These findings suggest that submandibular gland involvement in OCSCC is rare. Preservation of the gland may be considered in the absence of radiological or intraoperative evidence of tumor involvement.

Keywords: Squamous cell carcinoma; submandibular gland

Introduction

Oral cavity squamous cell carcinoma (OCSCC) is the most common malignant neoplasm of the oral cavity and is frequently associated with risk factors such as smoking and alcohol consumption^{1–3}. Surgical management, particularly neck dissection (ND), remains the cornerstone of treatment^{4,5}. According to the American Academy of Otolaryngology–Head and Neck Surgery (AAO-HNS) classification, ND of level Ib routinely involves excision of the submandibular gland, as it is a major drainage site for OCSCC and lymph node dissection may be challenging without gland removal. However, involvement of the submandibular gland in OCSCC is rare, with the reported incidence rates ranging from 1–5%, and

it usually occurs due to direct invasion or contiguity⁶. Submandibular gland excision may lead to several complications, including injury to the marginal mandibular, lingual, and hypoglossal nerves, as well as xerostomia, which can affect the patients' quality of life⁷⁻¹⁰. Consequently, selective preservation of the submandibular gland has been proposed, particularly in the absence of evidence of glandular invasion. This study aimed to describe the characteristics of patients with OCSCC and evaluate the incidence of submandibular gland involvement, thereby providing evidence to inform surgical decision-making.

Materials and methods

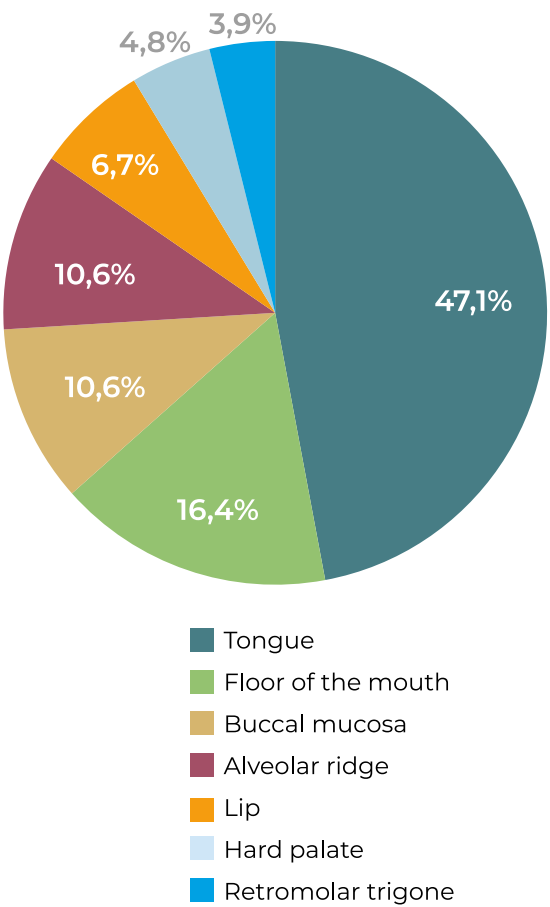
This retrospective observational study included all patients diagnosed with OCSCC who underwent ND of levels I-III or I-IV at the Santa Maria Local Health Unit over a period of six years, from 2019–2024. Clinical records were reviewed to collect demographic data, including age, sex, comorbidities, smoking, and alcohol consumption, and clinical data, such as tumor site, clinical and pathological staging, and histological submandibular gland involvement. The data were analyzed using the IBM SPSS Statistics software v.29.

Results

A total of 104 patients were included, with an average age of 64 years (range 32–88 years); comprising 67 men (64.4%) and 37 women (35.6%) (male: female ratio of 1.8:1). Risk factors included heavy alcohol consumption¹¹ in 36.5% and active smoking in 57.7% of patients. The majority of patients had comorbidities, the most common being hypertension (35.6%), diabetes mellitus (15.4%), and prior neoplasms (7.7%). The most frequent tumor site was the tongue (47.1%), followed by the floor of the mouth (16.3%), buccal mucosa, and alveolar ridge (10.6%) (Figure 1). At diagnosis, the predominant clinical tumor stage was cT2 (32.7%), and 45.2% of the patients had no lymph node metastasis (cN0) (Figure 2).

All patients underwent ND of levels I-III or I-IV, either unilateral or bilateral, as recommended by the National Comprehensive Cancer Network (NCCN) guidelines. ND of levels

Figure 1
Site-wise distribution of oral cavity squamous cell carcinoma



I-III and I-IV was performed in 56.0% and 44.0% patients, respectively. Unilateral procedures were more frequently performed than bilateral procedures (43.0% and 35.0%, respectively). The submandibular gland was excised in 96.1% of patients (n = 100). The only patient in whom the gland was preserved had cN0 disease, with intraoperative confirmation of benign level Ib nodes and no evidence of glandular involvement. Pathological examination revealed that 27.9% of tumors were pT2 and 51.9% of patients had no positive lymph nodes (Figure 3). Most patients with pN0 disease had early-stage tumors (pT1 and pT2), whereas extensive

Figure 2
Clinical staging of patients with oral cavity squamous cell carcinoma (cT and cN)

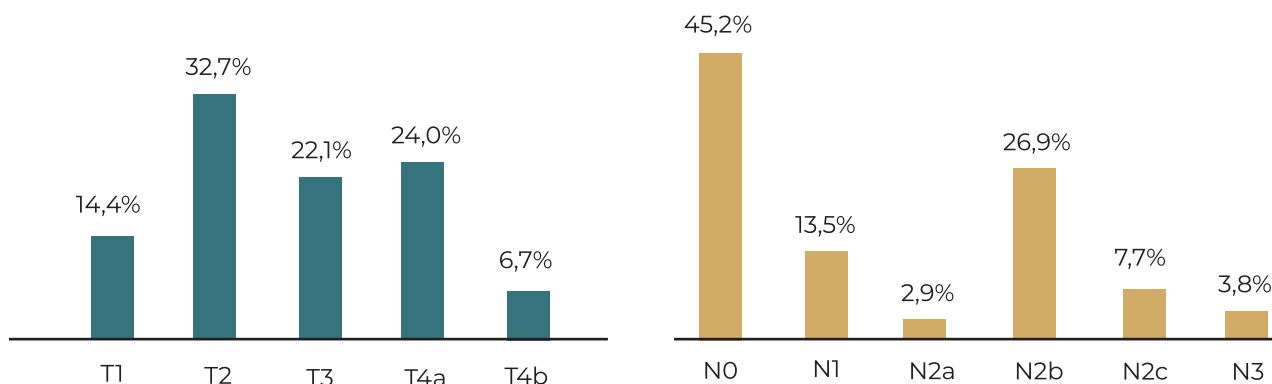
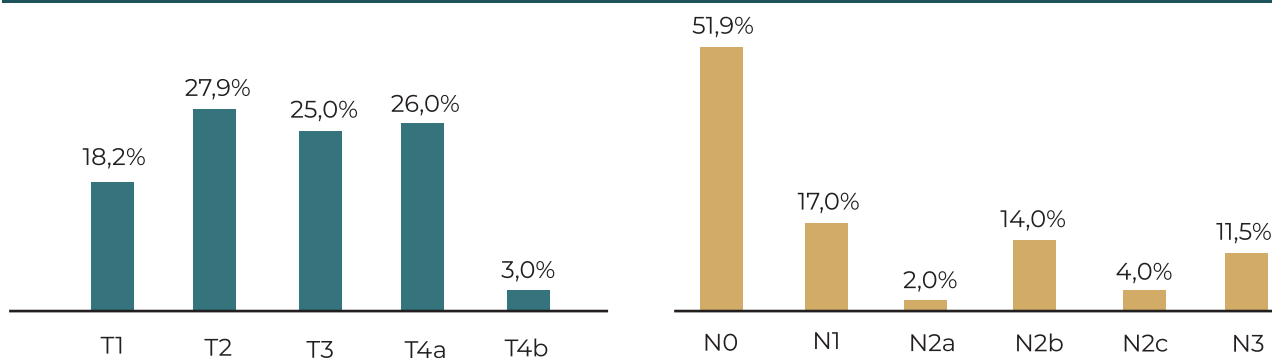


Figure 3
Pathological staging (pT and pN) of patients with oral cavity squamous cell carcinoma



nodal involvement was observed in pT4 tumors (Figure 4).

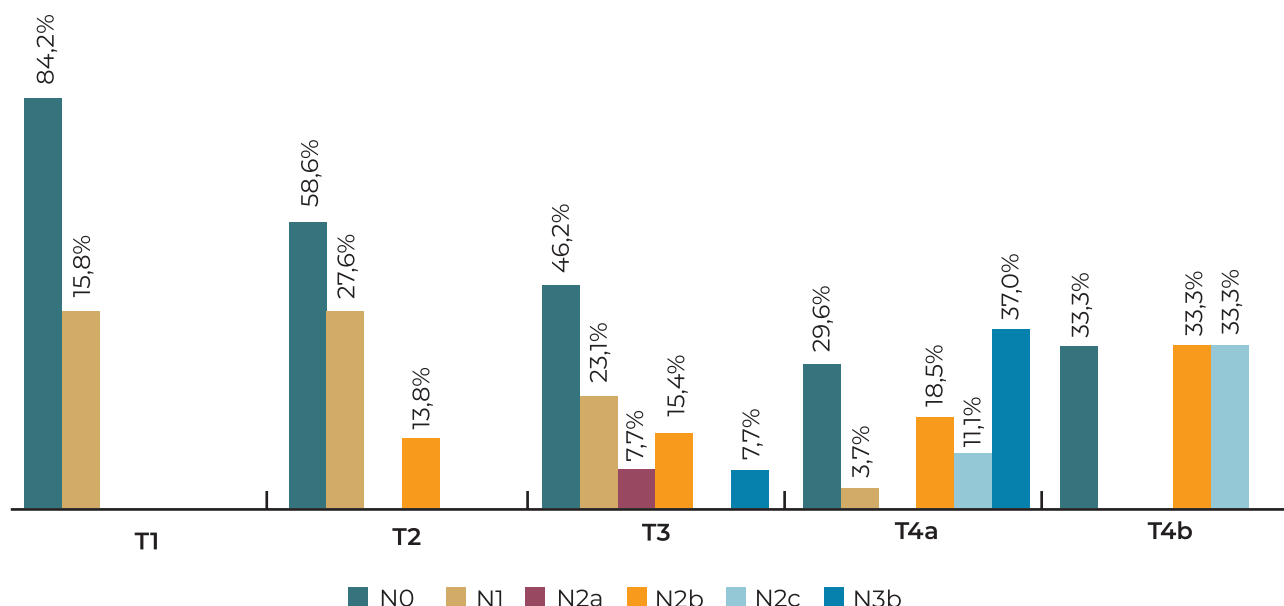
Direct submandibular gland involvement was observed in only one patient (1.0%), who had preoperative imaging evidence of glandular invasion and advanced disease (pT4aN3b).

Discussion

In this study, the incidence of submandibular gland involvement in patients with OSCC undergoing selective ND of levels I–III or I–IV was 1.0%, occurring in only one patient with advanced-stage disease (pT4aN3b) and preoperative imaging evidence of invasion. This finding is consistent with previously reported incidence rates of < 5%, typically associated with extensive tumors or significant level I lymph node disease^{1–6}. Although the submandibular gland is located within level Ib, one of the main lymphatic drainage regions of the oral cavity, it lacks intrinsic lymphatic tissue, making direct tumor invasion rare^{2–5}.

Ramchandrapa et al.¹ recently observed submandibular gland involvement in only 3% of cases, and recommended gland preservation in the absence of direct invasion. Similar findings by Mazarei et al.² support a selective surgical approach. Our study also confirms that most cases without nodal involvement (pN0) corresponded to early-stage tumors (pT1 and pT2), whereas advanced tumors (pT4) were more likely to present with significant nodal involvement, a pattern consistent with that in the literature, as evidenced by Razfar et al.⁸, who revealed that early-stage tumors had a low risk of cervical metastasis, including level Ib. Routine submandibular gland excision during ND remains a common practice, as observed in our sample (96.1%). However, this approach is associated with complications, including nerve injury and functional limitations. The submandibular gland accounts for up to 70% of the resting salivary flow, and its excision may cause xerostomia, resulting in impaired

Figure 4
Distribution of pathological staging (pT and pN) of oral cavity squamous cell carcinoma



swallowing, particularly in patients receiving adjuvant radiotherapy^{7,9}. Our findings support the feasibility of preserving the submandibular gland in selected patients, specifically those with early-stage tumors without clinical or imaging evidence of nodal or glandular involvement. This approach potentially represents a safe and beneficial option for patients, improving their quality of life. This approach aligns with the recent European Society for Medical Oncology (ESMO), European Head and Neck Society (EHNS), and European Society for Radiotherapy and Oncology (ESTRO) recommendations advocating less invasive approaches when oncologically safe¹⁰.

The limitations of this study include its retrospective design and small sample size, particularly the limited number of patients who underwent glandular preservation, restricting comparative analyses. Prospective studies with a higher evidence level and larger cohorts are necessary to validate these findings.

Conclusion

Our findings suggest that submandibular gland preservation during ND may be

feasible, particularly in patients without clinical or radiological evidence of glandular invasion. Preoperative imaging, intraoperative evaluation, and early tumor stage are key factors in selecting patients for gland-sparing surgery.

Conflict of Interests

The authors declare that they have no conflict of interest regarding this article.

Data Confidentiality

The authors declare that they followed the protocols of their work in publishing patient data.

Human and animal protection

The authors declare that the procedures followed are in accordance with the regulations established by the directors of the Commission for Clinical Research and Ethics and in accordance with the Declaration of Helsinki of the World Medical Association.

Privacy policy, informed consent and Ethics committee authorization

The authors declare that they have obtained signed consent from the participants and that

they have local ethical approval to carry out this work.

Financial support

This work did not receive any grant contribution, funding or scholarship.

Scientific data availability

There are no publicly available datasets related to this work.

References

1. Ramchandrapappa K, Shah R, Tyagi A. Can submandibular gland be preserved during neck dissection in oral cavity squamous cell carcinoma? *Indian J Otolaryngol Head Neck Surg.* 2022 Dec;74(Suppl 3):6351-6355. doi: 10.1007/s12070-022-03074-5.
2. Mazarei A, Khamushian P, Sadeghi Ivraghi M, Heidari F, Saeedi N. et al. Prevalence of submandibular gland involvement in neck dissection specimens of patients with oral cavity carcinoma. *Am J Otolaryngol.* 2022 Mar-Apr;43(2):103329. doi: 10.1016/j.amjoto.2021.103329.
3. Basha SS, Nayak V, Goel A, Panda SK, Sharma TP, Pande PK. et al. Predictive factors for submandibular gland involvement in oral cavity squamous cell carcinoma – a prospective study from a tertiary cancer center. *Indian J Surg Oncol.* 2021 Dec;12(4):737-744. doi: 10.1007/s13193-021-01414-5.
4. Mumtaz S, Salam H, Gulzar R, Shahid R. Prevalence of submandibular gland metastasis in squamous cell carcinomas of oral cavity. *Pak J Med Dent.* 2022;11(1): 44-49. doi: 10.36283/PJMD11-1/008
5. Jakheti A, Kaul P, Pandey A, Patel T, Kumar Meena J, Pal Singh M. et al. Distribution and determinants of submandibular gland involvement in oral cavity squamous cell carcinoma. *Oral Oncol.* 2021 Jul;118:105316. doi: 10.1016/j.oraloncology.2021.105316.
6. Pasha HA, Dhanani R, Ghaloo AK, Ghias K, Khan M. Level I Nodal positivity as a factor for involvement of the submandibular gland in oral cavity carcinoma: a case series report. *Int Arch Otorhinolaryngol.* 2021 Apr;25(2):e279-e283. doi: 10.1055/s-0040-1709117.
7. Kumar B, Kashyap N, Avinash A, Chevuri R, Sagar MK, Kumar S. The composition, function and role of saliva in maintaining oral health: a review. *Int J Contemp Dent Med Rev.* 2017;1-6. doi: 10.15713/ins.ijcdmr.121.
8. Razfar A, Walvekar RR, Melkane A, Johnson JT, Myers EN. Incidence and patterns of regional metastasis in early oral squamous cell cancers: feasibility of submandibular gland preservation. *Head Neck.* 2009;31(12):1619–23. doi: 10.1002/hed.21129.
9. Cunniff DM, Lipke N, Wax MK. Significance of unilateral submandibular gland excision on salivary flow in noncancer patients. *Laryngoscope.* 1998 Jun;108(6):812-5. doi: 10.1097/00005537-199806000-00007.
10. Machiels JP, Leemans CR, Golusinski W, Grau C, Licitra L, Gregoire V. Squamous cell carcinoma of the oral cavity, larynx, oropharynx and hypopharynx:

EHNSeESMOeESTRO Clinical Practice Guidelines for diagnosis, treatment and follow-up. *Ann Oncol.* 2020 Nov;31(11):1462-1475. doi: 10.1016/j.annonc.2020.07.011.

11. George Francisco. Detecção precoce e intervenção breve no consumo excessivo de álcool. Norma nº 030/2012 atualizada a 18/12/2014. Direção Geral da Saúde Disponível em <https://normas.dgs.min-saude.pt/wp-content/uploads/2019/09/detecao-precoce-e-intervencao-breve-no-consumo-excessivo-de-alcool.pdf>.